HAZARDOUS SUBSTANCES: Take 7 Steps to Switch to Safer Chemicals

In many workplaces, dangerous chemicals and substances are one of the most common hazards to both the environment and workers. There are measures you can implement to protect the environment and workers from such hazardous substances, such as spill prevention protocols and ventilation systems to prevent inhalation of these chemicals. But the most effective safety measure is to eliminate such chemicals from the workplace completely by replacing them with safer alternatives. To that end, the Occupational Safety and Health Administration (OSHA) in the US has published a toolkit that can walk you through the process of evaluating your current chemical use, considering alternatives, implementing substitutes and monitoring the results. Here's a look at why you should make this switch and how you can use this toolkit to do so.

BENEFITS OF SWITCHING

According to Transitioning to Safer Chemicals: A Toolkit for Employers and Workers, eliminating or reducing chemical hazards at the source, when coupled with a thoughtful, systematic evaluation of alternatives and the adoption of safer chemicals, materials, products and processes, can provide substantial benefits by:

Improving worker health and safety. Exposure to toxic chemicals on the job can make workers sick, causing cancer and other serious illnesses. And because there's often long latency periods between exposure to a chemical and the onset of a disease, the number of workers impacted by hazardous substances is likely underestimated. Replacing known hazardous chemicals with safer alternatives could help reduce this impact.

Creating safer products for the environment and consumers. Transitioning to safer chemicals in the workplace can also contribute to creating products that are less hazardous for the environment and the consumers who ultimately use the products.

Reducing costs. Using hazardous chemicals in the workplace results in substantial direct and indirect costs. Transitioning to safer alternatives can reduce these costs, as well as improving performance efficiency, industry leadership and corporate stewardship.

Enabling compliance with laws and regulations. The environmental and OHS laws both address hazardous substances and impose requirements for dealing with them. Transitioning to safer chemicals may help you comply with these requirements or make such compliance less burdensome.

TAKE 7 STEPS

Although Transitioning to Safer Chemicals: A Toolkit for Employers and Workers was written from a US perspective and references OSHA regulations, it's still a useful and applicable resource for Canadian companies. (For a purely Canadian approach from Ontario, see 'Hazardous Substances: How to Identify 'Green' Alternatives to Hazardous Chemicals.')

The OSHA toolkit spells out a seven-step process for identifying and implementing safer replacements for hazardous

chemicals used in the workplace:

Step #1: Form a Team to Develop a Plan

Assemble an internal team to take responsibility for developing the plan for transitioning to safer chemicals. The team may include JHSC members, workers, managers and union representatives. It’s important to involve workers who perform various functions in the workplace, such as engineers, maintenance workers and research and development staff. Also, identify any external stakeholders who should be included in the planning process.

The team should develop a plan for transitioning to safer chemicals. This plan should include setting goals, which can be long-term, industry-specific or chemical-specific. Your plan also may include:

- Company- or industry-specific policies on safety or chemical management;
- Targets for chemical use; and
- Approaches for prioritizing and managing chemical hazards.

Step #2: Examine Current Chemical Use

To identify targets for substitution, you need to know how you currently use chemicals in your workplace and the hazards associated with each of these chemicals. To get this information, the team will need to:

Conduct an inventory. Compile an up-to-date inventory of all the chemicals used in your workplace, including chemicals used during production, performing service tasks, and during cleaning and maintenance operations. The inventory should include information on:

- How the chemical is made, handled, stored, disposed or transported;

- The function the chemical performs;
- The chemical's physical form;
- The frequency and duration of the chemical's use;
- The quantity of the chemical used; and
- The hazards associated with the chemical.

The chemicals' SDSs (or SDSs) can provide a good starting point for the inventory, particularly as to the hazards. But make sure your supplier has provided you with a current SDS for each chemical.

Prioritize chemicals. In theory, you could transition to safer alternatives for every hazardous chemical used in your workplace, but doing so is probably unrealistic. Instead, the team should identify priorities to maximize the use of your resources. Chemicals can be prioritized based on various criteria, such as:

- Hazard, exposure or risk;
- Potential for regulation;
- Established company policies;
- Interests of relevant stakeholders; and
- Substitution potential.

Step #3: Identify Alternatives

After targeting a chemical as a possibility for substitution, broadly consider *all* possible chemical alternatives, material alternatives, process changes, design changes, technological solutions or other options to eliminate this chemical. Don't discount any alternatives at this stage'even if some options may not currently be feasible.

When looking for chemical alternatives, material substitutes or process changes for a particular application/use, the toolkit recommends starting with industry-specific information and examples of what's currently being used in the market. From there, you can usually identify specific companies that

are using alternatives; these companies are often good resources for identifying other alternatives they may be aware of or have tried. Suppliers, workers, industry associations, government officials, professional associations and non-governmental organizations may also be able to provide information on existing alternatives. The toolkit includes links to additional resources.

Step #4: Assess and Compare Alternatives

Next, the team will need to consider the various alternatives it has identified. It should first prioritize the alternatives based on performance to narrow the list down to those that have the potential to be effectively implemented in the workplace while maintaining process and product quality. To identify performance requirements for the chemical, material or product that you're looking to replace, the planning team should consider what the chemical, material or product needs to do and whether there are specific technical and engineering design constraints. Also consider other functional requirements, such as quality criteria and customer or legal requirements. Before further evaluating your options, move to the bottom of the list those alternatives that may result in new hazards or won't substantially improve safety.

After identifying the most promising alternatives, assess each one based on the following:

Hazard. Consider the various kinds of hazards the alternative itself could pose to both the environment or workers, including health hazards and safety hazards, such as flammability or reactivity.

Performance. Next, assess and compare alternatives based on their performance. To ensure the alternative performs well, some performance parameters you might consider include physical properties, such as density and weight, and performance characteristics, such as durability and

maintenance requirements.

Cost. Finally, alternatives should be assessed and compared based on their cost. Although a full cost-benefit analysis of all the alternative options is quite costly and not essential, it’s important to thoroughly consider relevant cost impacts, both positive and negative, on your company. Completing such an economic analysis will also help you make the business case to senior management for transitioning to safer alternatives. Some costs and benefits that you might consider in your evaluation include:

- Direct costs, such as capital expenditures and materials costs;
- Indirect costs, such as regulatory compliance costs;
- Liability costs, such as fines and clean-up costs; and
- Less tangible benefits, such as improved productivity and increased sales.

Step #5: Select a Safer Alternative

To select alternatives, consider the advantages and disadvantages of each option with regards to hazard, performance and cost, and identify any trade-offs that exist. The team may want to develop a table or spreadsheet that outlines the pros and cons of each option and their importance in the selection process. It could also develop a scoring system that weighs different attributes.

The actual selection of a preferred alternative should be directly linked to the goals of your company and project. The team should also determine whether there are other impacts of the alternatives, including, but not limited to, energy use, water use, environmental impacts, hazardous waste impact, and upstream or downstream hazards to workers.

Worker input is also important during the selection process. It may be helpful to openly discuss any drawbacks and benefits

of the options, as well as practical considerations of implementation, with any workers who might be affected by a change.

Once the team has selected alternatives, it should communicate the decision to all relevant parties, particularly those who'll work with the alternative chemical, material, product or process. It should document the decision-making process, including the thought process, assumptions and rationales used, so the decision can be clearly explained, justified and understood by others.

Step #6: Test the Selected Alternative

Before shifting completely to a safer alternative, test it on a smaller scale. The extent of the testing will depend on the complexity of the change. For some alternatives, you may need to conduct a field testing program to make sure the preferred alternative meets your performance expectations and product quality requirements, and that any unforeseen changes in use patterns or exposure are identified.

To get the best results, it's important to involve the workers who will be impacted by the change. Consult and involve workers to assess the performance, cost and health and safety impacts on the work environment. You should discuss when and how to make the change and ensure that workers are trained and feel comfortable working with the alternative chemical, product or process before the testing begins.

It's also important to identify and evaluate any potential unexpected problems that occur, including any shift in risks or new hazards presented by the alternative, such as ergonomic, noise, vibration, environmental impacts, fumes and gases formed in the process. And consider developing a job hazard analysis to describe the changes and identify hazards involved with shifting to a safer alternative. To ensure that the alternative isn't having negative impacts, consult your

incident reports to identify any unexpected injuries or illnesses or environmental impacts that may be associated with the alternative's use. Modifications to the choice of chemical, process or work practice alternatives may be necessary as a result of this pilot testing.

Step #7: Implement and Evaluate the Alternative

If the test is successful, plan the complete implementation of the alternative. The team should:

- Document the implementation plan;
- Decide who should be involved in implementation;
- Communicate the plan to workers; and
- Develop and perform the necessary training.

You also need to monitor and evaluate the full implementation of the alternative to ensure that it meets your expectations, including tracking the actual impacts on:

- The environment and worker health and safety;
- Performance and efficiency of the tasks or processes affected;
- Sales; and
- Services.

It's also important to keep yourself informed of any new alternatives. There may be safer, better performing, less costly innovations coming on the market in the future that could benefit your workplace.

Chemical Swap Success Stories

Here are two examples of companies that switched to safer chemicals and saw various benefits from doing so:

- Washing Systems, LLC is a chemical supplier to the laundry industry in Canada and the US. In 2005, the

company’s leadership made a decision to focus on developing new chemical technologies that are safer and environmentally sustainable. The initiative to develop a new ‘green’ line of detergents focused heavily on their use of nonylphenol ethoxylates (NPEs). In 2008, the company launched a new line of NPE-free detergents into the commercial laundry market, preventing over 4.5 million pounds of NPEs year from being discharged into the environment a year. Washing Systems also eliminated and reduced the use of other toxic chemicals with new formulations that were are not only less hazardous to workers and the environment, but also provided economic and efficiency benefits to its customers through reduced water and energy usage, increased wash productivity and lower chemical costs.

- DuPont is a large chemical manufacturer. Methyl isocyanate (MIC) is a highly toxic, irritating and flammable chemical that it used to produce the pesticide methomyl. After the 1984 deadly MIC release from the Union Carbide facility in Bhopal, India, which killed thousands and injured hundreds of thousands, DuPont implemented a new technology for producing methomyl at its plant in LaPorte, Texas. The company switched to the less acutely toxic chemical methylformamide and change its production process. DuPont’s new method reduced worker handling of several toxic chemicals; eliminated the need to transport, store, and transfer MIC and phosgene; and addressed lifetime cost issues.